DATA ANALYSIS

Scoping review on circular business models

Contents

1.Introduction

1.1 Reason for the investigation

In recent decades, the circular economy has developed as a sustainable alternative to the traditional linear economic model, in which products are produced, used and ultimately discarded as waste (Ellen MacArthur Foundation, 2013). The circular economy, on the other hand, focuses on closing material cycles through reuse, repair, recycling, and innovative business models that contribute to reducing resource use and waste generation (Geissdoerfer et al., 2017).

An important challenge within this concept is the diversity of circular business models that companies can apply to integrate circular principles into their business operations. Bocken et al. (2014) introduce a framework of archetypes for circular business models, describing different strategies to combine economic and environmental value creation. However, recent literature shows that the evolution of circular business models is complex and that there is no clear overview of how these models have evolved over time (Lüdeke-Freund et al., 2019). This lack of overview makes it difficult for companies to choose an appropriate strategy and apply it effectively in practice.

In addition to the scientific need for a systematic overview of the development of circular business models, there is also a clear practical relevance. Companies that want to implement circular strategies benefit from an overview of existing business models and their applicability within different sectors. A better understanding of the archetypes and their application can help companies develop effective circular strategies and promote sustainable value creation (Bocken et al., 2014).

This research therefore focuses on mapping the evolution of circular business models in the scientific literature. Using an analysis of the Proceedings of the New Business Models Conference (2016-2024), insight is gained into the trends and themes that have developed over the years.

1.2. Problem definition

The circular economy is increasingly cited as a necessary transition to promote sustainability and reduce economic dependence on finite resources (Geissdoerfer et al., 2017; Stahel, 2016). Circular business models play a crucial role in this transition, as they help companies to operationalize circular principles. Although there has been increasing research on circular business models in recent years, a systematic overview of their evolution and the different archetypes used in the literature is lacking (Lüdeke-Freund et al., 2019; Geissdoerfer et al., 2020).

The diversity and complexity of circular business models not only complicate theoretical conceptualization, but also make it difficult for companies to select and implement a suitable model. The multitude of models and frameworks leads to a lack of clarity about how they can be applied in practice and how they relate to each other. This not only limits scientific progress, but also makes it more challenging for companies to make strategic decisions in the field of circular entrepreneurship (Bocken et al., 2014; Lüdeke-Freund et al., 2019).

This research aims to bridge these knowledge gaps by mapping the evolution of circular business models and analysing how the scientific literature has conceptualised these models over time. This is done through a systematic analysis of the Proceedings of the New Business Models Conference (2016-2024), which examines trends, theoretical developments and the application of different archetypes

The central research question of this research will be as follows: **"*How have circular business models developed in the literature and which trends and themes are observable in the evolution of these models?*"**

1.3 Scientific and practical relevance

This research contributes to the scientific literature by providing a systematic analysis of the evolution of circular business models. Whereas previous studies such as Bocken et al.

(2014, 2018) were mainly focused on defining archetypes, this research focuses on the question of how these models have changed over time and which themes and trends can be observed in them. By analysing the evolution of these models based on recent scientific publications, a more complete and dynamic picture is painted of the development of circular business models within the literature.

From a practical perspective, this research provides valuable insights for companies and policymakers looking to implement circular strategies. A better understanding of how circular business models evolve and how they are conceptualized in the literature will enable companies to make more effective strategic choices. In addition, policymakers can use the insights from this research to align legislation and regulations with developments within circular entrepreneurship and sustainability strategies.

3. Method

3.1 Research method used

This research uses a scoping review as a methodology, with the aim of providing an overview of how circular business models have developed in the literature and which trends and themes are visible in them. The choice for a scoping review is based on the guidelines of Peters et al. (2015), which indicate that this method is suitable for mapping existing concepts and theoretical frameworks within a broad research domain. In contrast to systematic reviews, which are primarily focused on effectiveness and causal relationships, a scoping review focuses on structuring existing knowledge and identifying knowledge gaps.

The research process consists of data collection, selection of relevant literature, thematic analysis and synthesis of findings. The primary data sources for this research are the conference proceedings of the New Business Models Conference (2016-2024). This conference is internationally known for its focus on circular and sustainable business models and provides a representative dataset of current academic discussions and developments within this field.

A systematic search strategy has been applied to identify relevant publications. Search terms and selection criteria were established in advance, based on core concepts from the literature on circular business models, resilience and innovation. The initial selection took place on the basis of titles and abstracts, followed by a more in-depth analysis of the full papers to ensure relevance to this research.

A thematic approach was applied for the analysis, in which patterns and trends in the literature were iteratively categorized and analyzed. The results of this analysis form the basis for the conceptual framework and contribute to answering the central research question.

3.2 Dataset and selection procedure

For this scoping review, a systematic search strategy was used within the **conference proceedings of the New Business Models Conference (2016-2024).** This conference offers a broad overview of academic insights on circular business models and related themes.

The search strategy is based on a combination of **search terms that arise from the core concepts of circular economy, circular business models and innovation**. The exact search terms and the Boolean operators used are shown in **Appendix X**. The initial search yielded a wide range of studies, of which the following phases determined which are actually relevant for this review.

The selection procedure consisted of several phases:

- **Initial screening based on titles and abstracts**, in which irrelevant and double-published studies were eliminated.
- **Assessment of the full texts** of the remaining publications, in which the content was analysed in line with the research objective.
- **Final selection based on methodological transparency**, including only studies that made a clear theoretical and empirical contribution.

In total, **XXX papers** were identified in the initial search. After the initial screening, **XXX studies** remained, after which further review resulted in a final dataset of **XXX publications**. This process has resulted in a representative selection of studies that cover both theoretical models and practice-oriented applications of circular business models. This systematic approach has created a dataset that provides a solid basis for further analysis.

3.3 Operationalization

The concepts that are central to this scoping review are derived from the literature review and form the basis for the analysis of the selected studies. In this research, the focus is on **circular business models**, paying specific attention to their diversity, development and the influence of external factors.

To enable a structured analysis, the key concepts from the literature have been translated into **analytical categories**. This makes it possible to systematically evaluate and compare the publications found. The concepts are categorized based on:

- **The archetypes of circular business models** as identified by **Bocken et al. (2014, 2018).**
- **The R strategies (Reike et al., 2018),** which guide circular business models.

- **The influence of technological innovation and resilience** as important factors in the development of circular business models.

The analysis focuses on how these concepts are described in the literature, what strategies companies use and how external factors contribute to the effectiveness of circular business models. This structured approach makes underlying patterns in the selected literature visible.

3.4 Data analysis

The selected publications were analysed using a thematic analysis in ATLAS.ti, a qualitative analysis tool suitable for the systematic coding and analysis of textual data. This method of analysis makes it possible to uncover and interpret recurring patterns, concepts and themes within the literature.

The coding process consisted of several stages. In the first phase, an open coding was applied, highlighting key concepts and recurring themes in the texts. These concepts were then grouped into main and sub-codes, providing insight into mutual relationships. This process was carried out iteratively, always providing feedback to the theoretical models.

Previous scoping reviews (e.g. Peters et al., 2015) show that an iterative approach in thematic analyses contributes to a better understanding of the underlying dynamics. The combination of inductive and deductive coding ensured that both existing theoretical frameworks and new insights from the literature were correctly processed.

3.5 Validity and reliability

In conducting this scoping review, the validity and reliability of the method and analysis were carefully taken into account. By using a systematic and transparent approach in both the selection of literature and the data analysis, an attempt was made to ensure the reproducibility of the research.

To strengthen the validity of the study, clear selection criteria were used to identify relevant publications. The search terms and inclusion criteria used are predetermined on the basis of existing literature and theoretical frameworks, so that the collected data are representative of the research field. In addition, it has been ensured that the analysis is in line

with existing frameworks, such as the R strategies and circular business model archetypes, so that the findings are theoretically well-founded.

The reliability of the analysis is ensured by a systematic and repeatable coding procedure. By coding iteratively and providing feedback to the theoretical background, consistency in the data analysis has been maintained. Moreover, the selection of relevant themes is not only based on the frequency with which they appear in the literature, but also on their conceptual coherence and significance within circular business models.

A possible limitation of this study is that the analysis is based on conference proceedings, which means that the findings largely stem from ongoing research and academic discussions. Although this provides up-to-date insights, it may mean that certain circular business models or developments that mainly arise in practice are less strongly represented in the dataset. This underlines the importance of further studies that include empirical data in addition to academic sources.

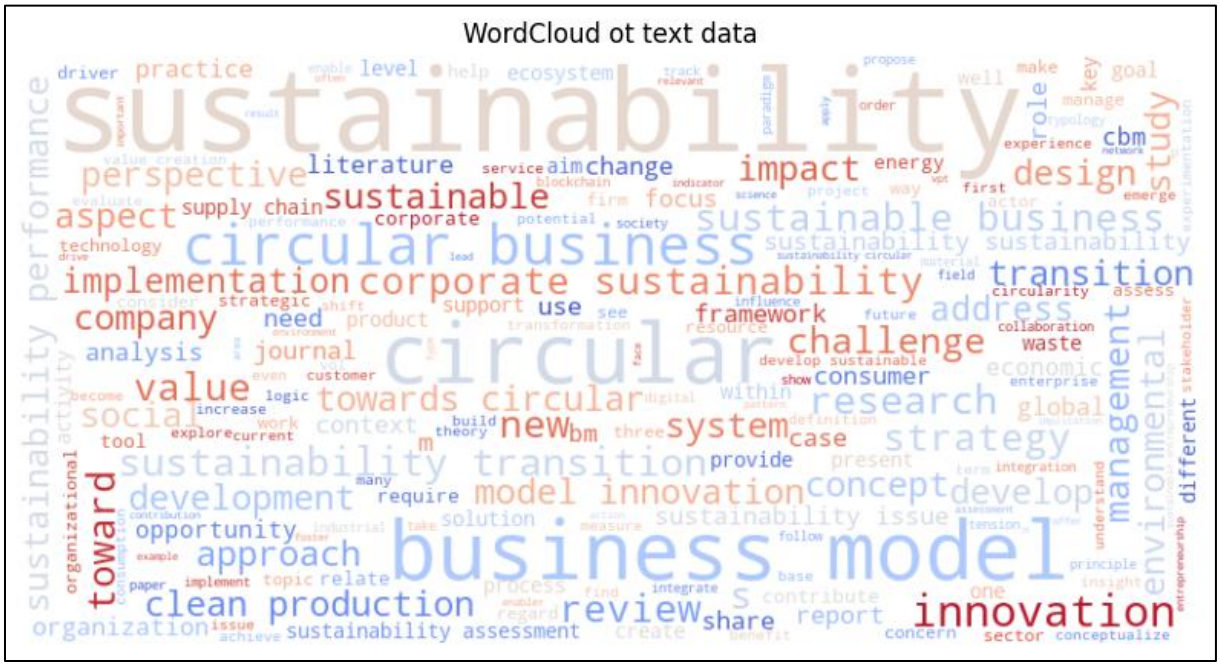
Through these methodological choices, this research provides a reliable and systematic basis for mapping circular business models and their evolution over time. The methodological considerations and transparent working method contribute to the robustness of the findings and their value for future research.

4. Results

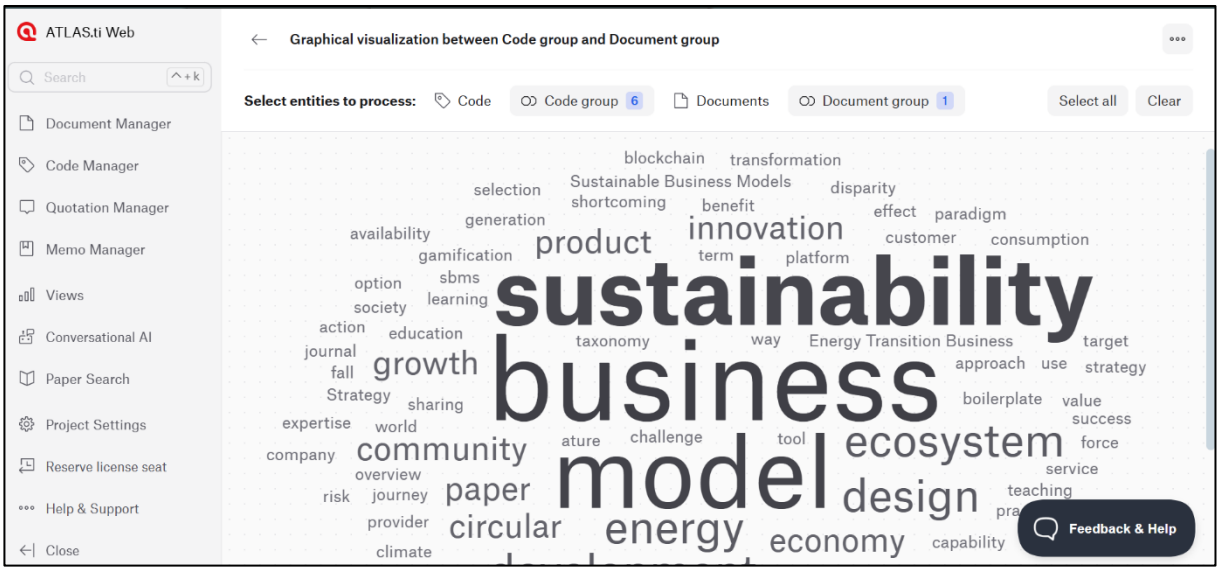
4.1 Trend Analysis

Before proceeding with the thematic analysis with ATLASti, we conducted an exploratory analysis of the textual data using word frequency and the word cloud. This analysis gave us an idea of our data. The results of this analysis on another software such as Voyant Tools, made us understand that the proceedings of the New Business Models Conference (2016-2024) all contained dominant terms including **"sustainability**", "**circular**", "**Business Model**", "**implementation**", "**transition**", "**innovation**", "**Design**", "**Impact**" and "**Challenge**". These terms allow us to understand that the sources for data collection are truly aligned with

sustainability as a central concept of circular business models, with an emphasis on their structure and implementation. Furthermore, this word cloud indicates that the analysis highlights the concrete effects and barriers to the adoption of circular models. It suggests that innovation and the design of new processes or products are central aspects of the literature studied.



The word cloud tells us much more, with keywords such as "**strategy**" and "**framework**" showing that the study is not limited to a theoretical description, but also examines the concrete strategies that companies employ. It also highlights the social and economic issues at stake, using terms such as 'value', '**cooperative**', '**business**' and '**social**', thus addressing the economic and social implications of circular models. Through keywords such as **'clean production'**, '**design**', '**development**' and 'concept', the word cloud highlights the interest in technical innovations and new industrial approaches related to the circular economy.

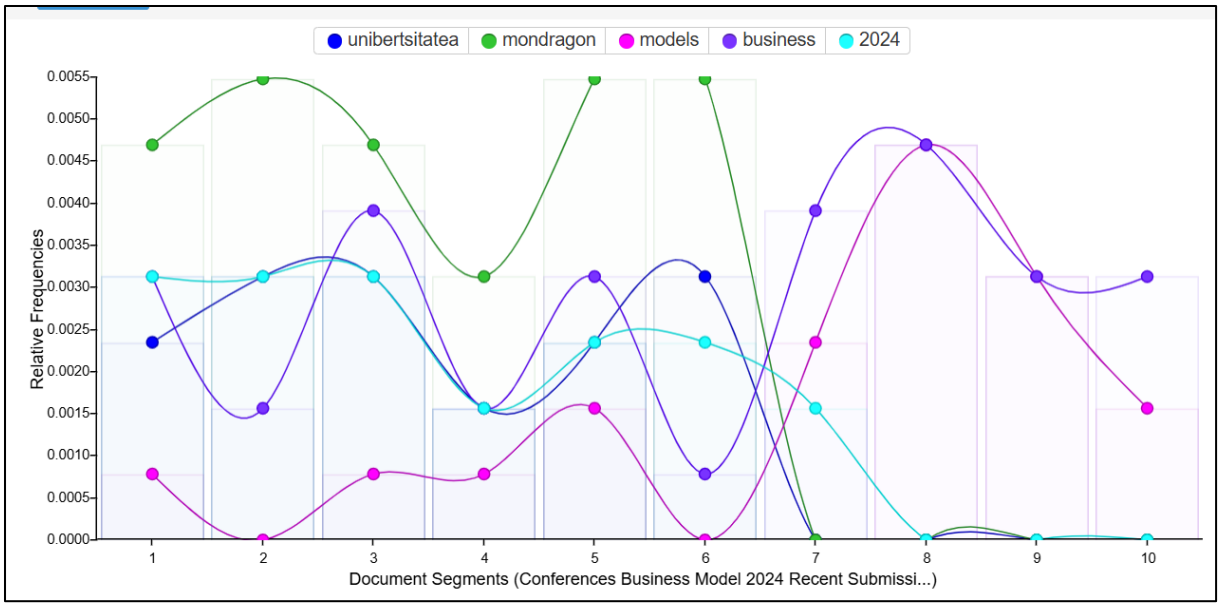


The emphasis on terms such as sustainability, implementation strategies and circular business models validates the methodological focus on our research objective: ***"to map the evolution of circular business models by analysing their conceptualisation in the scientific literature".***

Broadly speaking, the word cloud confirms that the research is indeed part of an analysis of trends and developments in circular business models, highlighting the implementation, impact and associated challenges. It also validates that the literature review covers strategic and practical aspects related to the transition to a circular economy.

4.2 Evolution of circular business models based on observed trends

The word trend graph is similar to the word cloud graph, which emphasizes the variability of frequencies. Indeed, the curves show a variation of keywords in different segments of texts, reflecting an evolution of the importance given to each aspect of circular business models in the academic literature. The word 'circular' and 'business' dominate in some segments, indicating an increasing focus on the usability and implementation of the principles in a business context.



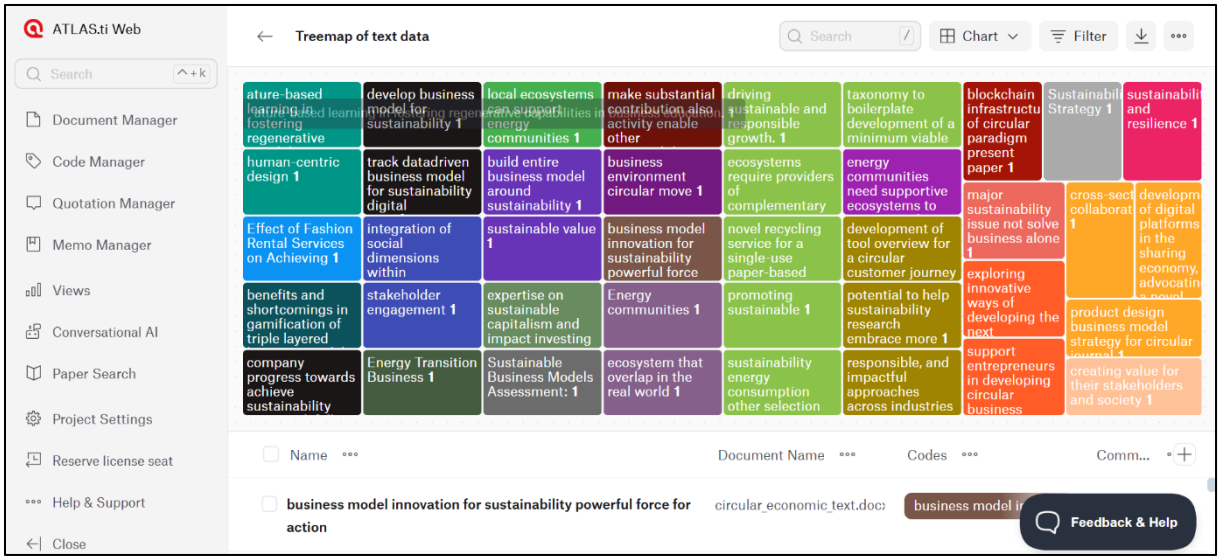
While textual data is collected on Business Models every year, this allows us to understand a trend in the conceptualization of circular models over time. An increase in the frequency of terms such as 'sustainability' and 'model' indicates a consolidation or standardization of ideas on the subject. The recurring use of 'business' and 'circular' reflects an increased focus on circular models applied in the entrepreneurial context. This finding aligns perfectly with our research objective to identify dominant archetypes and emerging strategies.

Our next interpretation will focus on thematic analysis to identify themes that focus on technological innovation or regulatory challenges and keywords that reveal a link to specific business strategies or industries pioneering the circular economy.

4.3 Mapping circular economy models: innovations and challenges

The thematic analysis shows different schools of thought around circular business models, highlighting two key trends: technological innovation and regulatory challenges shaping the transition to a more sustainable circular economy. Pioneering industries such as fashion, energy and digital are coming up with specific strategies to integrate circularity into their business models.

4.3.1 Segments focused on technological innovation and regulatory challenges



Technological innovation

- ***"Blockchain Infrastructure of Circular Paradigm"*** → Indicates interest in blockchain as a lever to optimize the traceability and efficiency of circular models.
- ***"Development of Circular Economy Toolbox"*** → Refers to technological tools developed to assess and support the circular transition.
- ***"New Recycling Service for Single-Use Paper***" → Highlights advanced technology solutions for recycling.
- ***"Sustainable energy consumption"*** → Highlights the role of renewable energy in the sustainability of business models.

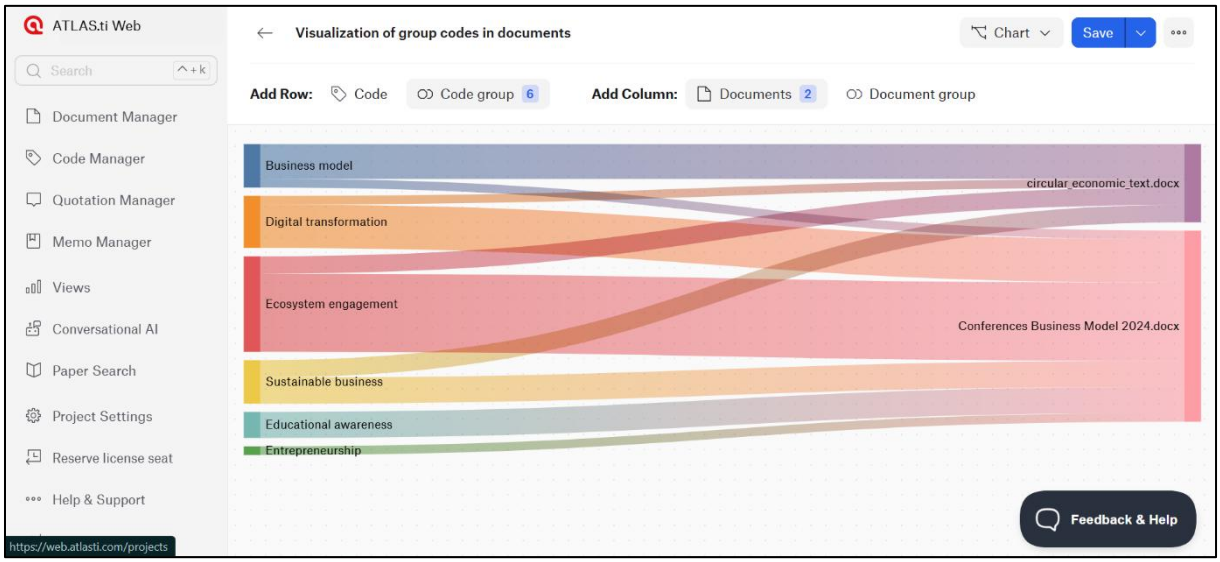
Regulatory challenges

- ***"Taxonomy for Biocapable Development"*** → Calls for normative frameworks to ensure the biological compatibility of products and services.
- ***"Solving sustainability issues not just business"*** → Highlights the need for a regulatory framework to support the transition.
- ***"Cross-sectoral collaboration of digital platforms***" → Suggests a need for cross-sectoral cooperation and regulation adapted to circular digital platforms.

4.3.2. Business strategies and breakthrough industries

Specific business strategies

- ***"Develop business model for sustainability digitally"*** → Indicates a transformation of business models to digital to integrate sustainability.
- ***"Stakeholder Engagement" & "Sustainable Capital and Impact Investing Expertise"*** → shows that stakeholder engagement and impact investing are key strategies.
- ***"Progress by companies towards achieving sustainability"*** → Shows that some companies are adopting specific strategies for circularity.
- ***"Responsible and impactful approaches across sectors***" → Demonstrate integrated responsible practices across sectors.



Industries pioneering the circular economy

- "Effect of Fashion Rental Services on Achieving Sustainability" → Show that the fashion industry, particularly through rental, plays a role in the circular economy.
- ***"Energy Transition Business"*** → shows that the energy sector is an important player in this transition.
- ***"Gamification of triple layered sustainability"*** → Indicates that the digital and gamification sector is involved in raising awareness and adopting sustainable practices.

In summary, the thematic analysis tells us that technological innovation with concepts related to blockchain, digital platforms and analytical tools, as well as regulatory challenges, require a clear framework to guide the circular transition. It also provides a better understanding of the specific strategies of companies and certain industries such as fashion, energy and digital are the front lines for experimenting with circular approaches.

4.4 Linking circular business models to R strategies

In this section, a matrix is presented that links the identified circular business models (CBMs) to the R strategies (Reduce, Reuse, Recycle, Remanufacture, Repair, Refuse). This helps to provide insight into which strategies are most commonly applied in different circular models and to what extent companies use certain R strategies. The analysis can contribute to a better understanding of how companies are shaping their transition to a circular economy.

Matrice: Circulaire bedrijfsmodellen en R-strategieën

Circulair bedrijfsmodel	Verminderen (Reduce)	Hergebruik (Reuse)	Recycleren (Recycle)	Hernieuwen (Remanufacture)	Repareren (Repair)	Weigere (Refuse
Functionele economie	✅	✅	❌	❌	✅	✅
Hernieuwde productie (remanufacturing)	❌	✅	✅	✅	❌	❌
Geavanceerd recycleren	❌	❌	✅	❌	❌	❌
Deelplatformen	✅	✅	❌	❌	✅	✅

This matrix provides a structured overview of the circular strategies that companies are using and shows which approaches are dominant within different CBMs. This can help to better understand the impact of circular business models and support strategic choices for companies.

5. Conclusions and discussion

5.1 Conclusions

The analysis of circular business models suggests that the adoption of sustainable strategies depends on the transformation of value chains, digital integration and cross-sectoral collaboration. On the other hand, it should be noted that companies face barriers related to standards, initial investment and changes in consumer behavior .

5.2 Discussion

The results of our analysis allow us to understand that technological innovation has a significant impact on the transition to circular models. However, the effectiveness of these models depends on government policies and the regulatory framework, which can speed up or slow down their adoption. The involvement of pioneering industries (fashion, energy, digital) illustrates how specific approaches emerge depending on sectoral constraints and opportunities.

5.3 Practical recommendations

- Increase the adoption of digital technologies (AI, blockchain, traceability) to improve resource management and optimize circular flows.
- Encourage public-private partnerships to remove regulatory and financial barriers.
- Develop economic incentives (subsidies, tax credits) to support companies in their transition to more sustainable models.

5.4 Scientific recommendations

- Conduct a more in-depth study of the sectoral impacts to identify the best practices and the levers for success specific to each sector.
- Explore the integration of new technologies such as IoT and data science to increase the effectiveness of circular models.
- Evaluate regulatory frameworks and their impact on innovation, in order to identify the most favourable policies for sustainable transition.

Summary

This study looks at the integration of circular business models in companies and examines the levers for innovation and the associated regulatory challenges. The goal is to analyze how business strategies are evolving toward sustainable practices in response to environmental and economic demands. The research places particular emphasis on technological innovation and its role in the transition to more circular models.

The methodology is based on a thematic analysis of texts from different academic and industrial sources. Using text mining tools such as word clouds and treemaps, important trends were identified. These analyses made it possible to establish links between emerging concepts and the strategic approaches of companies in different sectors.

The results highlight two key areas. On the one hand, technological innovation, in particular through digitalisation, blockchain and artificial intelligence, is proving to be a key driver for strengthening the circularity of business models. On the other hand, regulatory challenges are a major constraint, requiring political and economic adjustments to encourage the adoption of these models. Pioneering industries, such as energy, fashion and digital, stand out for their specific strategies aimed at optimizing resource use and minimizing waste.

The scientific contribution of this study lies in identifying the main factors influencing the adoption of circular economy models and in highlighting the synergies between innovation and regulation. By highlighting best practices and persistent challenges, this research provides a valuable foundation for policymakers, businesses and researchers who want to explore this topic further.